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A Digital Transformation Guide to Tackling Energy Challenges

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Executive Overview

Digital transformation has arrived for energy – and for a good reason. For years, industries continued about their daily workflows with little concern for the impact that it was having on the world around them. This has resulted in dozens of different energy challenges, including depleting some of our most valuable resources and altering our planet's climate.

Commercial buildings waste 30 percent of their energy used on average, making it low-hanging fruit that will make a difference for your bottom line and the planet. Digital transformation can help you tackle these energy challenges.

In this white paper, you'll learn:

- How eight different industries are tackling energy issues with digital transformation
- Why AI is critical to achieving energy efficiency for buildings
- Steps you can take and obstacles to avoid

The Problem with Our Energy Consumption

When discussing energy and digital transformation, one of the most urgent topics that come up is climate change. This is inevitable since 87 percent of <u>greenhouse gas emission</u> comes from energy production.

How we live and work each day dictates how we consume energy. In developing countries, carbon dioxide emissions fall around 4.8 tons annually per capita. This number rises in more affluent countries. In 2018, CO_2 emissions across the globe hit a staggering 36.6 billion tons. Unsurprisingly, the largest, more developed countries and regions consume the most energy:

	% of World Population	% of World GDP	% of World Energy Consumption
UNITED STATES	5%	15%	17%
EUROPEAN UNION	6%	16%	11%
CHINA	18%	18%	24%

In 2018, CO₂ emissions across the globe hit a staggering **36.6 billion tons**

The per capita daily energy consumption in the U.S. is equivalent to the consumption of 2.6 gallons of oil, 255 cu. ft. of natural gas, and 9.7 lbs. of coal. On average, people in the mainland U.S. emit more CO_2 in four days than people in Ethiopia, Malawi, or Uganda emit in a year.

In 2020, the COVID-19 pandemic drove down <u>energy and emission trends</u> as demand dropped by almost 4 percent. This resulted in a 5.8 percent drop in global energy-related CO_2 emissions – roughly 2,000 million tons or equivalent, removing all the emissions of the European Union from the global total. This is something that has never been seen since World War II. The same study saw declines in CO_2 emissions in the following key sectors:

- **Transportation:** The transport sector due to the implemented movement restrictions. This drop accounted for 50 percent of the total decline in emissions for 2020. Sales of electric cars also grew by more than 40 percent to over three million units.
- **Power:** The CO_2 emissions in the power sector declined by 450 MT, or roughly 3.3 percent, from the previous year. This is also backed by the increase in the generation of power from renewable sources, which went up to 29 percent in 2020 from 27 percent the previous year.

However, experts see that the emissions will go back as economic activities resume. For example, China showed a 7 percent increase in emissions in December 2020 compared to the same period in 2019. The same is true for the United States, where emission levels are rebounding close to the same levels in the same month in 2019.

While steps are being taken to explore more sustainable energy sources, we're still far away from a solution. From digital transformation, energy resilience, green manufacturing, and industry 4.0, we're taking steps to address issues that can affect how we live now and impact the survival of future generations.

What is Digital Transformation and Why Does It Matter?

According to the International Data Corporation (IDC), worldwide <u>spending on digital</u> <u>transformation</u> will hit \$2.3 trillion by 2023. Organizations are spending on digital investments to improve how they do business, their daily workflows, and how they deliver their products and services to consumers.

Digital transformation is the rethinking and reimagining of how businesses use technology to improve processes, customer experience, and corporate culture. Organizations find the link between their operations, science, measurable data, and analytics to solve traditional issues and improve their overall performance.

With digital transformation as part of the equation, solutions to current problems can be fast, innovative, and scalable. Below are some of the most known benefits of digital transformation:

1. Better Customer Experience

At the center of digital transformation is the satisfaction of the end-users or the consumers. A good digital transformation strategy puts the customers at the center. Businesses should build around their customers' happiness and create value by truly understanding their needs using the available data and technologies.

2. Improved Operations and Lower Risks

With the proper adoption of technologies, businesses can be more responsive to current trends and reduce risks from potential threats. More efficient processes are implemented concurrently with the agile strategy to remove bottlenecks through automation, better communication, collaboration, among others. Manual processes will be replaced with digital and quicker ones, which will help improve the overall efficiency of the workflow.

3. More Robust Decision-Making Process

Decisions made are based on insights from customer interactions and combined data. These are transformed into actionable steps that zero in on achieving business goals. Digital transformation takes a holistic approach that involves the front office, middle, and back office. The process results in a more cohesive team with agility and excellent collaboration.

4. Lower Costs and Improved Profitability

Digital transformation creates value. Processes can be reengineered for efficiency to gain better market share. With the use of digital platforms and Artificial Intelligence, some businesses can improve their efficiency by 40 to 50 percent, creating a significant impact on profitability.

To achieve digital transformation, it is essential to evaluate the current situation, gather support from all levels of the organizational management, educate staff, and implement technologies such as automation where applicable. Worldwide spending on digital transformation will hit **\$2.3 trillion by 2023**

How Digital Transformation Can Shape a More Sustainable World

Digital transformation is not just about implementing disruptive technologies but also influencing a significant shift in the culture of people. Its effects go beyond the boundaries of the corporate environment. When executed correctly, it can help create a more sustainable world – one where we understand our responsibilities and obligations, not only to our employees or customers but also to the planet.

The World Economic Forum sees digital transformation paving the way for <u>a more decarbonized</u> <u>global economy</u>. Following a digital transformation journey, there's a potential for certain industries to avoid releasing 26 billion metric tons of net CO₂ into the atmosphere through 2025. The logistics sector can avoid 9.9 billion metric tons of CO₂, the automotive industry can avoid 540 million metric tons, and the electricity sector by 15.8 billion metric tons.

According to the IDC Spending Guide, 30 percent of the forecasted spending on digital transformation will come from the discrete and process manufacturing sector. Companies will continue their digital evolution with more autonomic operations and the use of robots in manufacturing.

The retail sector will also spend to improve their digital ecosystem and aim to achieve omnichannel platforms to capture orders and process fulfillment. The professional services industry will chip in the move for a more sustainable world by focusing on intelligent energy management in buildings, while the transportation sector will focus on more innovative freight management.

Some of the most significant opportunities for digital transformation to improve the environment include:

- **Pollution Control:** Digital technologies can be used to understand and manage air pollution, CO₂ emission, and water pollution. The use of IoT and big data opens different channels to save resources and minimize the impact of human existence on the environment.
- Waste Management: From solid waste, food waste, agri-waste, and e-waste, available technologies can be employed for collecting waste on demand, for example. IoT can also be used to monitor food wastage and improve the behavior of people.
- **Sustainable Production:** Cleaner manufacturing processes, supply chain, and source reduction can be achieved using big data.
- Smart Buildings and Cities: Digital transformation of cities will lead to intelligent buildings and smart cities. Such structures can make most of the available network infrastructure and connectivity to help people responsibly consume energy and lower their carbon footprint.

The World Economic Forum sees digital transformation paving the way for a **more decarbonized global economy**

Digital transformation helps companies become more efficient and resilient while also making them more responsible toward the planet and mankind. Here are eight sectors embracing digital business models to achieve a kind of transformation that addresses current and potential energy issues:

1. Data Centers

Data centers are the backbone of the internet and everything that depends on technology. They are energy gobblers, responsible for 1 percent of <u>electricity consumed</u> around the globe. According to studies, data centers consume about 200 TWh of electricity per year, which is more than the energy consumption of several countries.

While there is a common notion that these data centers will consume more energy as we use more data, the most prominent players in the industry have taken steps to minimize their carbon footprints.

In 2016, it revealed that <u>machine learning capabilities</u> of the cutting-edge AI, DeepMind, helped the company reduce the energy used for cooling its data centers by 40 percent, <u>reducing carbon</u> <u>emissions</u>. A good example of this is Google, which was able to neutralize its legacy carbon footprint. The search engine giant also aims to operate on carbon-free energy 24x7 by 2030.

Experts predict that the electricity use of data centers will be 15-fold by 2030. Likewise, some researchers foresee data centers as potential energy suppliers on the grid during their off-peak operational hours, putting to good use their investments in green energy systems that primarily serve as backup power.

For most enterprises, their digital transformation starts with the infrastructure of their data centers. Aging facilities lack the scalability and efficiency that evolving technology requires. If in-house data centers are out of the equation, companies can outsource their needs to a colocation provider, which might have access to more energy-efficient data centers.

2. Logistics

The global logistics market is estimated to grow to \$15.5 trillion in 2023 and will likely handle 92.5 billion tons of goods by 2024. The demand can be attributed to the e-commerce boom, with consumers able to shop from devices in the palm of their hands. With the expected growth in the sector, transportation and warehousing are expected to produce more pollutants and greenhouse gases.

While consumers patronize brands that do their share in protecting the environment, a study finds that only five to 10 percent are willing to pay the price for that. For consumers, sustainability comes next to performance and quality.

UPS aims to have one-fourth of its new vehicles run on alternative fuel or have advanced technologies to improve fuel efficiency. By 2025, the company aims to see 40 percent of its fuel from sources other than diesel or gasoline. In Germany, the company is experimenting with the fulfillment of last-mile deliveries by putting a container in the center of the city where delivery riders will pick packages up and bring them to the intended recipients using electric bikes.

Likewise, DHL aims to have zero emissions by 2050. Aside from actively participating in decarbonizing the shipping industry, it influences its subcontractors to push for emission reduction. This can be correlated to a study by Prologis, which stated that direct-to-home delivery from fulfillment centers in cities could lower transport-related greenhouse gases by 50 percent. The same study also spotlighted how e-commerce deliveries using circular routes can reduce transportation-related emissions by as much as 90 percent.

Aside from sustainable transportation, these companies aim to right-size their packaging and use Industrial Internet of Things technologies to improve warehouse automation.

3. Commercial Real Estate

The <u>commercial real estate</u> (CRE) sector in the United States comprises roughly 16 billion square feet of floor space and more than 250 billion kWh. In North America, CRE represents 40 percent of energy use and about 35 percent of the total carbon emission. With a huge carbon footprint, it is no surprise that property owners try to find ways to cut energy costs.

The COVID-19 pandemic has revealed the state of digital transformation in the CRE sector. A Deloitte survey found out that most <u>CRE companies are not ready</u> in many areas of digital transformation. Only a third of CRE companies say that they have the skills and resources to operate a digitally transformed business. Less than 50 percent say they're competent in ensuring digital tenant experience. Only 41 percent of these companies say they have exerted more in the digital transformation efforts of their organization.

Those who were quick to adjust were able to use various methods to ensure an excellent digital tenant experience, including:

- Virtual property tours
- Cloud-based collaboration tools
- Digital communication channels for tenants to use

However, 56 percent of respondents said they believed they were not yet ready to follow digital workflows or digitize essential business processes. Some opportunities these CRE companies need to explore may include:

- Evaluate Existing Technologies: Check the maturity level of available technologies that help manage operations, deliver good customer experience, and develop tech talent for the workforce.
- Focus on Technologies that Deliver Strategic Value: Invest in technologies that can serve as building blocks to the digital transformation success, such as AI, cloud, process automation, among others.
- Frame Digital Transformation Execution Plan: The transformation team must have the right leadership and talents to implement the transformation and innovation.

The survey also revealed that only 40 percent of the companies have a defined digital transformation roadmap. While most respondents know they need to invest in technologies to boost their digital transformation efforts, only 45 percent will increase their automation, AI, and cloud spending in the next year.

Other property technologies that can help in the digital transformation include building information modeling, the Internet of Things, AI, big data, and analytics. All of these will help collect actionable data for more efficient operations of CRE properties.

4. Hospitality

There are more than 54,000 hotels in the United States with over 5 million rooms for occupancy; if it weren't for the pandemic, they would be operating 24-hours a day, 365 days a year. If that were the case, each guest room would incur an average energy bill of \$2,200 per year.

Technology in the hotel industry is at the forefront of ensuring that guests have optimal experiences. The ultimate goal is the guests' satisfaction from the moment they check in until they check out and everything in between.

Mobile technology remains the backbone of the hotel guest experience, but other technologies further improve the process. Brands continue to invest in converting traditional rooms to smart rooms where guests can control the hotel's amenities using an app.

Likewise, using data from previous visits of guests, smart hotels or smart resorts can automatically set room temperature, lighting, or even have a ready playlist of their favorite movies or songs. The possibilities of hyper-personalization are endless when customer data are processed properly combined with smart technologies.

IoT is the building block to the hyper-personalization of the experience. On the back end, hotels also make use of AI with machine learning to analyze big data. With the insights provided by these technologies, hotels improve their decision-making capabilities significantly on issues that impact the environment, such as energy consumption, water usage, pollution, and garbage. For example, Marriott aims to reduce its carbon intensity by as much as 30 percent by 2025. Hilton also plans to lower its emissions by 61 percent by 2030.

Using the hospitality industry data, we can build more intelligent buildings and structures that are energy smart. With smart buildings, brands can save as much as 15 percent in energy costs and minimize risks as they respond in real-time to surges in the cost of electricity or real-time weather events.

An example of this is how Grand Hyatt San Francisco uses AI technologies to <u>lower energy</u> <u>consumption</u>, saving them thousands of dollars along the way. The hotel saves over 20 percent of its costs on the controlled load while getting a 41 percent ROI, recouping its investment in energy monitoring and automation in just six months.

5. Manufacturing

According to the Energy Information Administration, the industrial sector accounted for 32 percent of the total energy consumption in the U.S. This includes the use of natural gas, petroleum, electricity, renewable energy, among others.

Manufacturing is going through digitization, and this shift happening now is termed Industry 4.0. The Fourth Industrial Revolution focuses on the integration of technologies such as Internet of Things, AI, and robotics to create smart manufacturing systems. The resulting systems make good use of data analytics and machines communicating with each other to impact how goods are delivered to the physical world.

EIA's 2018 Manufacturing Energy Consumption Survey reveals that since 1998, the manufacturing sector has been <u>becoming more fuel-efficient</u>. The gross output of manufacturers went up by 12 percent, while its fuel consumption dropped by 16 percent. During the same period, the labor output improved by 62 percent.

Smart factories are the future. In the U.S., 86 percent of manufacturers see <u>smart factories</u> as the leading indicator of competitiveness by 2025. In the same survey, 83 percent of the respondents believe that smart factories will transform how products are manufactured.

With smart factories, technology fuses with human skills. As we bring together information from AI, robotics, industrial IoT (IIoT), and other technologies, business leaders should make most of the information and maximize the value.

Predictive maintenance is also another technology that defines Industry 4.0 factories. A real-time alert and response system can save manufacturers a significant amount of money due to downtime.

6. State and Local Government

While the private sector has been making strides in digital transformation, governments have been called by the World Economic Forum as the dinosaurs during this digital age. With the adoption of technology, state and local governments can be more responsive to their constituents, deliver services more efficiently, and create policies that provide real solutions to current and future challenges.

Public leaders must also pursue the establishment and evolution of smart cities. The development of these urban spaces that use technologies to manage energies and resources needs stimulating innovation by authorities in collaboration with the private sector.

With <u>smart city technologies</u> in use, a locality can reduce its emissions by nearly 10 to 15 percent. However, to achieve this, governments need to deal with a good amount of digitization. According to a non-profit organization Information Technology and Innovation Foundation, governments are generally afraid to risk it given the meager incentives versus the chances of failure.

Budget constraints are another big obstacle to digital transformation in the public sector. A local government must build a robust IT infrastructure to serve as the foundation of a smart city. A good network will create the ideal environment to implement smart technologies. This will then allow them to manage essential services that will empower the people and drive growth.

With AI systems properly utilized, people can enjoy intelligent transportation systems, connected vehicles, smart traffic management systems, among others. Likewise, with a good network, we can build homes with smart appliances and energy management systems. A practical example of this can be found in the best smart cities in the world.

The 2020 Smart City Index ranked Singapore, Helsinki, and Zurich as the <u>top smart cities</u> today. The organizers looked into technologies used for health and safety, mobility, digital activities, work and school, and governance. In most of these smart cities, people can easily report city maintenance issues online, utilize apps to find parking spaces, buy tickets online, or even monitor how public funds are used.

7. Electrical Infrastructure

Utility companies that transform their operations through digitization create significant value. A study shows that they can <u>reduce operating costs</u> by as much as 25 percent, which leads to higher profits. There are also substantial gains of up to 40 percent in performance, safety, customer satisfaction, and compliance.

Digital transformation opens up possibilities that will ultimately benefit the consuming public. Areas to invest in include energy plant optimization, predictive maintenance, crew productivity analytics, and customer journey optimization. These will lead to savings in terms of operations and create value across the utility value chain.

A good example of this is General Electric's implementation of digital infrastructure on its Digital Wind Farm. Using sensors, data, and good analytics, GE <u>boosted production</u> of the wind farm by 20 percent and with a potential \$50 billion in value delivered to the wind farm industry.

The digital control of the electric grid gives way to the realization of more intelligent buildings, modernizing residential and commercial properties. Smart systems will transform our experience with improved security, easier maintenance, more cost-efficient utilities. Smart buildings will adjust themselves to be more efficient and possibly switch to greener energy sources when possible. With these capabilities, businesses and individuals can lessen their carbon footprints significantly.

8. Automotive

Vehicle production is one of the most energy-intensive industries in existence. A study by the Argonne National Laboratory claims that it takes an equivalent of 260 gallons of gasoline to produce a vehicle that is around 3,000 pounds. The relative energy consumption is more for hybrid or electric vehicles because of the batteries they need to run. However, you have to factor in that green cars produce less pollution and prioritize cleaner energy sources to charge their batteries.

Automakers are taking steps to have greener fleets. The $\underline{CO_2}$ emission in vehicle production has also dropped by 24 percent from 2008 through 2017. Water consumption during vehicle production also decreased by 31 percent.

Digital transformation in the automotive industry does not happen only in the production line. Carmakers such as Tesla make good use of connectivity and technology to update their vehicles, easily pushing updates to their electric vehicles to give them new features or do maintenance via software when possible.

Tesla is also using a neural network to analyze data collected from its vehicles on the road. This information helps the company design autonomous driving capabilities that can make the road safer for everyone. It might also pave the way for autonomous taxis where vehicles can earn for their owners while busy at work or just spending time at home.

Why AI is Key to Digital Transformation and Energy Efficiency

Artificial intelligence has proven itself beyond the hype; it is key to both digital transformation and energy efficiency.

Role of AI in Digital Transformation

Al is changing our lives and the world around us. It's there on the production lines, making sure there are next to zero human errors. And it's there to help you find your new favorite songs.

Al is the key enabler to effective digital transformation across industries. It helps us make the most of available technologies to improve profitability, ensures security and data privacy, and enhances the customer experience. In a 2017 study, 98 percent of those who used Al for their digital transformation gained additional revenue. It goes hand in hand with human ingenuity, which drives innovation and flexibility.

Al helps businesses digest data. Together with Machine Learning, Al helps us make sense of all the information we collect to make and adjust our decisions on our processes and workflows – allowing them to be more streamlined and result in satisfied customers.

Role of AI in Energy Efficiency and a Sustainable Future

Al plays a significant role in the digital transformation of businesses and is also <u>essential in</u> <u>achieving energy efficiency</u> to ensure a healthier future for Earth and future generations. Decreasing energy consumption and CO₂ emission is necessary for nearly every organization today.

Powerful AI platforms coupled with IoT devices can help optimize the consumption of energy. Using these, we can monitor the consumption of the tiniest appliances at home or the biggest machines in the production line. We can gather valuable data that can help us prevent losses and catch problems before they happen.

With AI, we can also do energy forecasting to make solar and other renewable energy sources or energy storage more practical and efficient. AI can analyze real-time weather information, so we know when to use or preserve green energy.

A study by Microsoft and PwC has pointed to several important gains achieved using AI:

- Increase global GDP by as much as 4.4 percent by 2030: With optimized use of inputs, better productivity, and automation, the economic yield can be as high as \$5.2 trillion.
- Lower global greenhouse gas emissions by as much as 4 percent by 2030: Al can contribute to the reduction of global GHG emissions by as much as 2.4 gigatons or the combined yearly emissions of Japan, Australia, and Canada.
- Save up to 32 million hectares of forest globally by 2030: Using satellite data and real-time information on forest conditions, AI can help us take countermeasures versus deforestation.

Al plays a significant role in the digital transformation of businesses and is essential in **achieving energy efficiency**

> AI CAN HELP UP GLOBAL GDP BY AS MUCH AS



AI CAN LOWER GLOBAL GREENHOUSE GAS EMISSION BY AS MUCH AS



AI CAN POTENTIALLY SAVE 32 BY 2030

Obstacles to Digital Transformation

Despite considerable investments, not all companies achieve digital transformation. More often than not, digital transformation efforts fail because of the following reasons:

- Not understanding the true meaning of digital transformation: Transformation is different from digitization itself. You need to see technologies as tools to find the solutions you need to achieve your business goals. A siloed view or a reactive perspective will not work.
- Lack of support from top leadership: You need to convince top-level management to support the digital transformation efforts. Many resources are needed, and you need C-level commitment to execute appropriately.
- **Ignoring resistance:** You need to assess the current state of your company. Not everyone will be open to changes and there will be significant changes along the way. Everyone must understand what benefits they will enjoy when they achieve digital transformation.
- Did not change processes for intended results: You have to design the methods according to your objectives. Part of this should be achieving a forward-thinking work culture of all stakeholders. Leaders must also take into account issues within their industries.
- Lack of talent: Build a talent pool. You need a skilled workforce to ensure the success of the transformation. You need people with expertise in the IT field. You can also outsource work to service providers if that will be more cost-efficient.
- No clear digital transformation strategy: You need to build a clear roadmap to properly execute your digital formation journey. Execute in phases and start with a pilot program before you go all out.

Using Digital Transformation to Tackle Energy Challenges: Start with Smart Buildings

One key path to a more sustainable future is through digital transformation of our planet's buildings.

According to the U.S. EPA, <u>commercial buildings</u> in the United States waste 30 percent of the energy used on average. The potential to reduce consumption and energy wastage is enormous. Understanding the key drivers for implementing improvements in these structures can dramatically help energy efficiency and lower greenhouse gas emissions associated to their operations.

A quick analysis of a <u>smart building</u> puts a spotlight on how it focuses on connectivity, collaboration, control, and conservation. The ecosystem consists of physical components of buildings, such as the HVAC, gateways, lighting, energy meters, and sensors. The structure will be interwoven with digital automation, cloud storage, and IoT technologies.

With a <u>properly designed smart building</u>, you can optimize the control of facilities, including building security or climate control. The ultimate goal of operating a smart building is resource conservation. Using data analytics, you can achieve energy conservation by looking at office space usage or unit occupancy, for example.

With smart building solutions, you can monitor energy usage, so there will be no surprises. You can use this information to improve overall efficiency. Some smart building systems can even automate how energy consumption is optimized. Here are some of the initial steps to make most of the available smart building technologies:

1. Measure Before You Upgrade

You need to collect data from your existing infrastructure. Remember that you cannot improve on what you don't measure. Install IoT energy meters to get detailed data on the energy consumption of your HVAC, lighting, and equipment. You can compare this to industry standards and so you can set your efficiency goals properly.

2. Put Your Data to Work

Problem areas must be identified and resolved using insights from measured tests. Al can help enrich the data streams from your sensors, giving you actionable insights to implement that can help improve your energy consumption. Don't forget to measure your little wins along the way. You can set your initial metrics and have micro metrics for experiments when executing digital transformation. Ultimately, you will check your business outcomes and see the impact of transformation on your revenue, customer value, productivity, among other metrics.

Using Digital Transformation to Tackle Energy Challenges: Start with Smart Buildings (continued)

3. Aim for Operational Efficiency

Smart buildings can save you from the hassle of unexpected shutdowns, faulty equipment, or scheduling errors. You can make use of AI and algorithms that will predict equipment failure. Intelligent systems can pinpoint potential problems, so you can repair or maintain equipment before regularly scheduled maintenance would have caught the issue. This can also help free up your staff to focus on higher-value projects, rather than being reactive when issues arise.

Summary

You don't need to take a big leap to get started with digital transformation. Your building's energy consumption is the low-hanging fruit that will make a difference for your bottom line and the planet.

Get started with better energy intelligence that can help you tackle your energy challenges today.

Get started with better energy intelligence that can help you tackle your energy challenges today.



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